



## Total Organic Carbon (TOC) Measurement of Unknown Solid Samples by TRLI-TOC

### 1. Introduction

The aim of this publication is to show reliability of our TRLI-TOC analyzer in measuring TOC concentration of the industrial waste samples. Determination of TOC is based on the principle of TOC=TC-IC. Total Carbon (TC) and Inorganic Carbon are measured during the analysis. Details on the repeatability of the assay and the empirical findings are presented below.

**Sample Description: Unknown Sample - Solid**

### 2. Experimental Conditions

In the IC studies, the samples were dissolved in 60 mL of pure water for analysis. The measurements are done under following settings of the analyzer:

Parametre	Value
Decomposition Zone Temp.	900 °C
Catalytic Zone Temp.	750 °C
Air Pressure	1.5 bar
Carrier Gas Flow Rate (TC)	250 mL/min
Carrier Gas Flow Rate (IC)	1000 mL/min

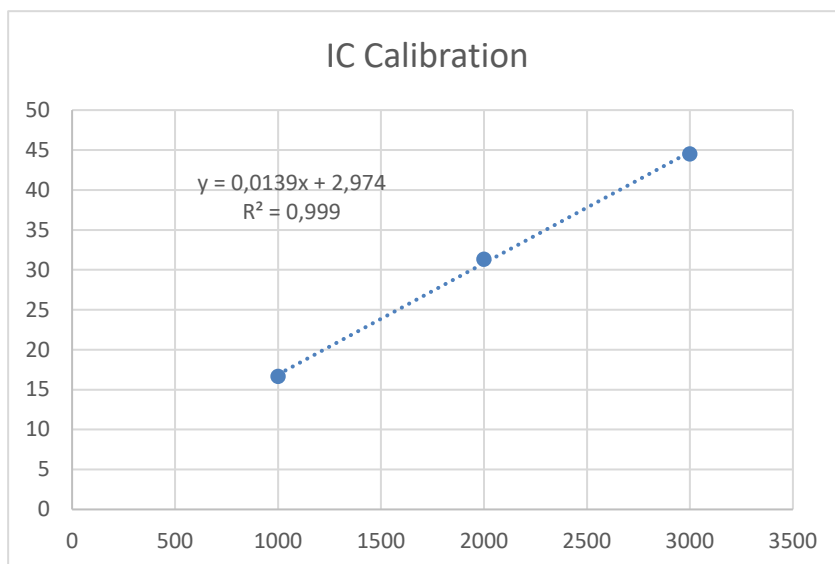
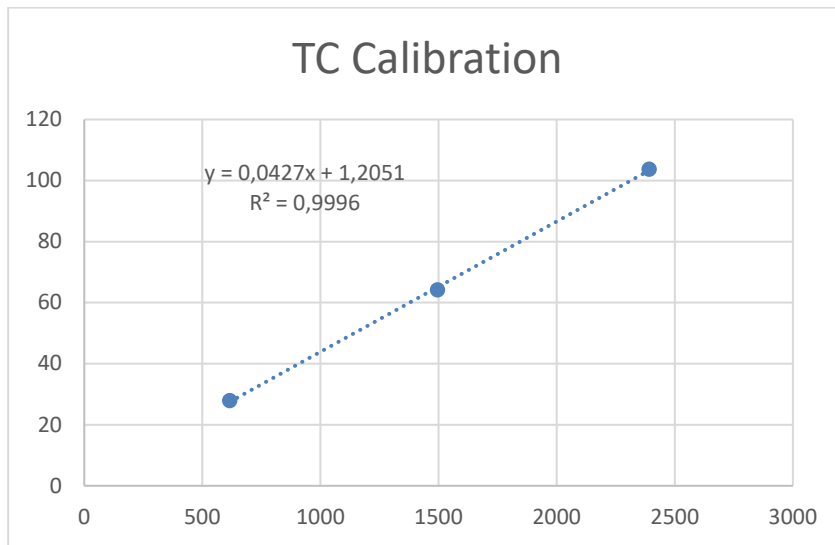
### 3. Calibration

Calibration is done by waging solution having below specification and calibration curves are here below.

Standart Name	Standart Concentration
CaCO <sub>3</sub> (for TC)	12%
KHCO <sub>3</sub> (for IC)	10000 ppm

Calibration Equation (TC)	R <sup>2</sup>
$y = 0.0427 \cdot x + 1.2051$	0.9996

Calibration Equation (IC)	R <sup>2</sup>
$y = 0.0139 \cdot x + 2.974$	0.9990



#### 4. Results

The TC and IC content for the unknown samples are calculated by the TRLI-TOC software, along with the RSD values, are as follows:

**TC Analysis:** Pre-weighed samples were put into quartz sample boat which is inserted into TC decomposition furnace with sample loading car when analysis start. Each sample was analyzed in 4 repeats.

**IC Analysis:** Pre-weighed and dissolved samples were put into vials and inserted into the IC chamber of the instrument then; each sample were acidified to analyze inorganic carbon automatically by TRLI-TOC.



Table 1: Unknown Solid Sample 1 TC Analysis Results

Repeat No.	Sample Size(mg)	TC Result (%)	TC Average (%)	RSD (%)
1	10 ± 0.2	5.88	5.94	1.26
2	10 ± 0.2	6.04		
3	10 ± 0.2	5.96		
4	10 ± 0.2	5.88		

Table 2: Unknown Solid Sample 1 IC Analysis Results

Repeat No.	Sample Size(mg)	IC Result (%)	IC Average (%)	RSD (%)
1	50 ± 0.2	4.29	4.22	2.18
2	50 ± 0.2	4.12		
3	50 ± 0.2	4.25		

Table 3: Unknown Solid Sample 2 TC Analysis Results

Repeat No.	Sample Size(mg)	TC Result (%)	TC Average (%)	RSD (%)
1	10 ± 0.2	6.97	6.84	1.25
2	10 ± 0.2	6.77		
3	10 ± 0.2	6.81		
4	10 ± 0.2	6.82		

Table 4: Unknown Solid Sample 2 IC Analysis Results

Repeat No.	Sample Size(mg)	IC Result (%)	IC Average (%)	RSD (%)
1	50 ± 0.2	1.89	1.91	3.63
2	50 ± 0.2	1.99		
3	50 ± 0.2	1.85		

Table 5: Unknown Solid Sample 3 TC Analysis Results

Repeat No.	Sample Size(mg)	TC Result (%)	TC Average (%)	RSD (%)
1	10 ± 0.2	9.85	9.92	1.19
2	10 ± 0.2	9.88		
3	10 ± 0.2	9.87		
4	10 ± 0.2	10.10		

Table 6: Unknown Solid Sample 3 IC Analysis Results

Repeat No.	Sample Size(mg)	IC Result (%)	IC Average (%)	RSD (%)
1	50 ± 0.2	5.19	5.15	0.67
2	50 ± 0.2	5.15		
3	50 ± 0.2	5.12		



Table 7: Unknown Solid Sample 4 TC Analysis Results

Repeat No.	Sample Size(mg)	TC Result (%)	TC Average (%)	RSD (%)
1	10 ± 0.2	4.10	4.16	1.69
2	10 ± 0.2	4.16		
3	10 ± 0.2	4.26		
4	10 ± 0.2	4.14		

Table 8: Unknown Solid Sample 4 IC Analysis Results

Repeat No.	Sample Size(mg)	IC Result (%)	IC Average (%)	RSD (%)
1	50 ± 0.2	2.75	2.85	2.85
2	50 ± 0.2	2.89		
3	50 ± 0.2	2.90		

TOC concentrations are calculated as the difference between TC and IC:

Table 9: Unknown Samples TOC Result

Sample No.	TOC Calculated (%)
1	1.72
2	4.93
3	4.77
4	1.31

## 5. Conclusion

In this study, the total carbon (TC) and total inorganic carbon (IC) content of unknown solid samples were calculated. High repeatability results were obtained with the TRLI-TOC analyzer in the study conducted with the unknown samples. Due to the high IC content of the samples, the analysis was performed under high flow and with 10% phosphoric acid.